

Short Communications

Feed refusal in cattle associated with *Fusarium moniliforme* in corn

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FOLLOWING the feeding of a new batch of shelled corn to 10 holstein cattle which had previously readily accepted corn, the animals' consumption dropped to zero and three of them subsequently developed diarrhoea and ataxia.

In order to determine the cause of the animals' condition, samples of the shelled corn were screened for mycotoxins (aflatoxins B₁, B₂, G₁, and G₂, ochratoxins A, G, C and ochratoxin B methyl ester, sterigmatocystin, T-2 toxin and zearalenone), polybrominated biphenyls and insecticides. All tests proved negative. However, incubation of the kernels for five days at 25°C, after first being shaken for two-and-a-half minutes in a 0.525 per cent solution of sodium hypochlorite, resulted in the isolation of one species of fungi, *Fusarium moniliforme* Sheldon. No other species of fungi was isolated by this technique.

An experiment was then conducted to discover whether *F. moniliforme* Sheldon contamination in the corn was responsible for the feed refusal observed in the cattle.

Cracked corn (300 g) was autoclaved with 90 ml distilled water. The sterilised substrate was then inoculated with 1 ml spore suspension of the *Fusarium* species to be tested (Table 1) by dispersing conidia from a seven-day-old yeast malt agar slant. Flasks were incubated without agitation at 25°C for 14 days.

Two calves weighing 125 and 150 kg (calves 1 and 2 respectively) were vaccinated against infectious bovine rhinotracheitis, bovine virus diarrhoea and parainfluenza type 3 and given *Leptospira*, *Clostridium chauvoei* and *Clostridium septicum* bacterins. They also received thiabendazole. During a 20-day acclimation period, increasing amounts of untreated corn were fed until calves 1 and 2 were consuming 0.66 and 1.0 kg, respectively, twice daily. Thereafter, test corns in the same quantities were offered (Table 1). Hay was constantly available. Each test was separated from others by feeding untreated corn.

Six test corns were fed to the calves during the experiment. Corn B was prepared using the *F. moniliforme* isolate from the field case. As *F. moniliforme* is a major parasite of corn, it was necessary to evaluate other *F. moniliforme* strains. Corns A and C were cultured with *F. moniliforme* strains not associated with feed refusal. Corn D was autoclaved and dried and corn F autoclaved and allowed to stand at 25°C for two weeks before drying. In an attempt to provide a positive control, corn E was inoculated with *Fusarium graminearum* Schwabe NRRL 5883 (a producer of vomitoxin, a feed refusal factor in swine, and zearalenone). Analysis of this corn revealed 250 ppm vomitoxin and 40 ppm zearalenone. Corn H, from which all others were prepared, was fed untreated to determine acceptability before treatment.

In addition, untreated corn mixed with corn contaminated with *F. moniliforme* isolated from the field case (corn B) was fed. After consistent consumption was established, corn B was increased and untreated corn decreased, the total remaining constant, and intake again determined.

Untreated corn was consistently accepted. Corn B was

TABLE 1: Refusal response of calves to corn cultured with the field *Fusarium moniliforme* isolate and other fusaria and uninoculated corn

Diet	Calf	Feed trials*	Refusal [†]	% refusal	% of total consumption (%)	Overall consumption (%)
Corn A	1	18	0	0	0	90.8
	2	5	0	0		
	Total	23	0			
Corn B	1	18	8	44	63	31.2
	2	20	16	80		
	Total	38	24			
Corn C	1	13	11	85	71	24.5
	2	15	9	60		
	Total	28	20			
Corn D	1	38	0	0	0	100.0
	2	17	0	0		
	Total	55	0			
Corn E	1	11	5	45	36	63.6
	2	11	3	27		
	Total	22	8			
Corn F	1	10	1	10	26	67.0
	2	9	4	44		
	Total	19	5			
Corn H	1	10	1	10	5	91.1
	2	9	0	0		
	Total	19	1			

*Constant amount offered morning and afternoon; each feeding comprised a feeding trial

[†]Refusal was defined as 25% or less consumption of corn ration offered

Corn A Cultured with *F. moniliforme*, NRRL 2284, a known producer of plant hormone gibberellic acid

Corn B Cultured with isolate of *Fusarium moniliforme* from corn associated with feed refusal in cattle in Illinois field case

Corn C Cultured with *F. moniliforme* NRRL 6054, an isolate from South Carolina

Corn D Autoclaved 25 minutes then dried

Corn E Cultured with *F. graminearum* NRRL 5883, a known producer of vomitoxin and zearalenone

Corn F Autoclaved for 25 minutes, left to stand at 25°C for 2 weeks, then dried

Corn H Untreated

offered in two trials and overall consumption is shown in Table 1. When calf 2 was fed undiluted corn B it was accepted for two feedings but consumption then dropped to zero on most feedings. The calf frequently dumped the feeding pan upon receiving corn B. Within 24 hours of first ingesting corn B, calf 1 developed dark watery faeces. Diarrhoea increased and became green the second day. The third day the animal totally refused corn B. Thereafter, a 50/50 mixture of corn B and untreated corn was fed to this calf and the diarrhoea subsided. Normal faeces were observed four days after the initial feeding. No other illness was associated with corn B.

When offered mixed untreated corn and corn B, both calves consistently sorted through and avoided eating the latter. When calf 1 was fed a 3:1 ratio of corn B and clean corn, consumption averaged 77 per cent; when a 9:1 ratio was fed consumption averaged 74 per cent. Calf 2 consumed a 1:1 mixture but a 3:1 mixture was refused.

Of the two other *F. moniliforme* strains, corn A was accepted but corn C was refused more often than corn B. The 36 per cent feed refusal exhibited by the calves toward *F. graminearum* fermented corn E occurred mostly during the first five feedings of each animal, while the last five were totally consumed. This *F. graminearum* cultured corn containing vomitoxin and zearalenone caused less refusal than either of the toxic *F. moniliforme* strains.

The data illustrate that although physical treatment of corn may decrease palatability, some strains of *F. moniliforme* have a far more dramatic effect. Pronounced diarrhoea was associated with corn contaminated with *F. moniliforme* Sheldon in three of the field cases and one of the experimental calves.

Refusal was judged to be caused by a change in palatability as calves accepted untreated corn after refusing treated corn the previous feeding.

F moniliforme is a ubiquitous organism in several *Graminea* species. Unless feed refusal is reproduced by pure strains incubated with sterile substrate, the isolation of the organism is not sufficient to implicate it as the sole cause of refusal. For this reason, practical diagnosis awaits the identification of the specific feed refusal factor(s).

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